

CLAIM AMENDMENTS

1. (Currently amended) A method for regulating an engine, comprising:
 - providing an engine including one or more combustion chambers, an intake manifold,
 - and a source of gaseous fuel;
 - mixing the gaseous fuel and air upstream of the one or more combustion chambers to provide a mixture of air and fuel through the intake manifold to the engine for combustion, wherein the gaseous fuel includes one or more of natural gas, propane, or petroleum gas;
 - driving an electric power generator with the engine, the generator being operable to provide AC electric power; and
 - adjusting a ratio between air and fuel in the mixture to regulate frequency of the AC electric power provided by the generator; and
 - regulating rotational speed of the engine with a PID control based on a number of multipliers selected as a function of pressure in the intake manifold.
2. (Original) The method of claim 1 further comprising providing a fuel line to supply fuel to the engine, the fuel line including a controllable valve for regulating fuel flow therethrough, said adjusting the ratio comprising adjusting the controllable valve.
3. (Original) The method of claim 1 further comprising compensating for transient operation of the engine.
4. (Original) The method of claim 3 which includes providing a throttle configured to regulate flow of the mixture, said compensating for transient operation being performed in accordance with a throttle position.
5. (Original) The method of claim 1 wherein the engine includes one or more spark ignition devices in correspondence to the one or more combustion chambers, and which includes

changing activation timing of the one or more spark ignition devices to maintain a desired rotational engine speed.

6. (Original) The method of claim 5 which includes retarding the activation timing of the one or more spark ignition devices in response to an engine load loss of 30% or more.

7. (Original) The method of claim 5 further comprising maintaining the desired rotational engine speed by adjusting a flow of the mixture.

8. (Original) The method of claim 7 further comprising:
providing a throttle configured to regulate flow of the mixture; and
changing position of the throttle to adjust the flow of the mixture.

Claims 9 and 10. (Cancelled).

11. (Previously presented) A system for generating electrical power, comprising:

An internal combustion engine including an intake manifold;

An electric power generator coupled to said engine to be driven therewith;

A first sensor to sense rotational speed of said engine and output a first signal
corresponding thereto;

A second sensor to sense manifold pressure and output a second signal corresponding
thereto;

A controller responsive to said first signal and said second signal to generate a valve control signal to regulate engine speed relative to a desired rotational engine speed in accordance with a number of gain multipliers each determined as a function of the rotational speed of said engine with the manifold pressure by adjusting a ratio of a mixture of fuel and air provided to said engine for combustion.

12. (Original) The system of claim 11 wherein said controllable valve is provided in a fuel line for supplying gaseous fuel, said controllable valve being operable to regulate fuel flow therethrough in response to said valve control signal.

13. (Original) The system of claim 11 further comprising a throttle configured to regulate flow of said mixture, said controller being operable to compensate for transient operation of said engine at least in accordance with throttle position.

14. (Original) The system of claim 11 wherein:

said engine includes one or more combustion chambers and a corresponding one or more spark ignition devices; and

said controller being further operable to regulate said engine relative to a desired rotational engine speed by adjustment of activation timing of said one or more spark ignition devices.

15. (Original) The system of claim 11 further comprising a throttle operable to adjust flow of said mixture.

16. (Cancelled).

17. (Previously presented) A method, comprising:

operating an internal combustion engine including a manifold coupled to a number of combustion chambers;

providing a mixture of fuel and air to the combustion chambers through the manifold;

detecting a change in rotational speed of the engine;

adjusting the mixture from a first fuel-to-air ratio to a second fuel-to-air ratio in response to said detecting to regulate the rotational speed of the engine, which includes governing the rotational speed of the engine with a PID controller; and

driving an electric power generator with the engine during said adjusting.

18. (Original) The method of claim 17 which includes adjusting activation timing of a number of ignition devices each associated with a corresponding one of the combustion chambers.

19. (Original) The method of claim 18 which includes retarding timing of the ignition devices in response to an engine load loss of 30% or more.

20. (Original) The method of claim 17 wherein said adjusting includes changing a flow of fuel to a mixer with a controllable valve.

21. (Original) The method of claim 20 wherein the fuel is of a gaseous type.

22. (Original) The method of claim 17 which includes regulating the rotational speed of the engine in accordance with a sensed rotational engine speed and a manifold pressure.

23. (Original) The method of claim 22 wherein said regulating is further performed in accordance with intake manifold temperature and manifold pressure.

24. (Original) The method of claim 22 wherein said regulating includes estimating the air mass flow based on an emptying/filling model of the manifold.

25. (Cancelled).

26. (Original) The method of claim 17 which includes sensing exhaust gas oxygen and fuel mass flow.

27. (Original) The method of claim 17 which includes pressurizing the mixture provided to the manifold with a compressor driven by a turbine turned by exhaust from the engine.

28. (Previously presented) A system comprising:

an internal combustion engine including a manifold to selectively supply a mixture of gaseous fuel and air to each of a number of combustion chambers, the combustion chambers each corresponding to one of a number of spark ignition devices;

means for pressurizing the mixture provided to the manifold with a compressor driven by a turbine turned by exhaust from the engine;

means for supplying the mixture to said manifold;

means for sensing rotational speed of said engine;

means for adjusting the mixture from a first fuel-to-air ratio to a second fuel-to-air ratio in response to said sensing means to regulate engine rotational speed; and

means for driving an electric power generator with said engine.

29. (Original) A method, comprising:

operating an internal combustion engine including a number of combustion chambers and a corresponding number of spark ignition devices;

pressurizing a mixture of fuel and air with a compressor, the compressor being driven with a turbine turned by exhaust from the engine;

providing the mixture to the combustion chambers of the engine;

driving an electric power generator with the engine;

detecting a sudden engine load loss of 30% or more; and

retarding timing of the spark ignition devices in response to the sudden engine load loss.

30. (Original) The method of claim 29, which includes regulating rotational engine speed during said driving to maintain a desired frequency of AC electrical power provided by the generator.

31. (Original) The method of claim 30, wherein said regulating is performed as a function of sensed rotational engine speed.

32. (Original) The method of claim 31, wherein said engine includes a manifold arranged to provide the mixture to the combustion chambers and said regulating is performed as a function of sensed temperature and pressure associated with the manifold.

33. (Previously presented) A method, comprising:

providing an engine including one or more combustion chambers and a source of fuel;
mixing the fuel and air upstream of the one or more combustion chambers to provide a mixture of air and fuel to the engine for combustion;

driving an electric power generator with the engine, the generator being operable to provide AC electric power;

adjusting a ratio between air and fuel in the mixture to regulate frequency of the AC electric power provided by the generator; and

regulating rotational speed of the engine with a PID control based on a number of multipliers selected as a function of an engine manifold pressure.

34. (Previously presented) The method of claim 33 further comprising compensating for transient operation of the engine.

35. (Previously presented) The method of claim 33 wherein the engine includes one or more spark ignition devices in correspondence to the one or more combustion chambers, and which includes changing activation timing of the one or more spark ignition devices to maintain a desired rotational engine speed.

36. (Previously presented) The method of claim 35 which includes retarding the activation timing of the one or more spark ignition devices in response to an engine load loss of 30% or more.

37. (Previously presented) The method of claim 35 further comprising maintaining the desired rotational engine speed by adjusting a flow of the mixture.

Response to Office Action
Inventor(s): Thomas, Robert J. et al.
Application No.: 10/081,851
Filed: February 22, 2002
Page 8 of 13

38. (Previously presented) A method, comprising:

operating an internal combustion engine including a manifold coupled to a number of combustion chambers;

providing a mixture of fuel and air to the combustion chambers through the manifold;

sensing exhaust gas oxygen and fuel mass flow;

detecting a change in rotational speed of the engine;

adjusting the mixture from a first fuel-to-air ratio to a second fuel-to-air ratio in response to said detecting to regulate the rotational speed of the engine; and
driving an electric power generator with the engine during said adjusting.

39. (Previously presented) The method of claim 38 which includes:

adjusting activation timing of a number of ignition devices each associated with a corresponding one of the combustion chambers; and

retarding timing of the ignition devices in response to an engine load loss of 30% or more.

40. (Previously presented) The method of claim 38 wherein said adjusting includes changing a flow of fuel to a mixer with a controllable valve, and the fuel is of a gaseous type including at least one of natural gas, propane, and petroleum gas.

41. (Previously presented) The method of claim 38 which includes regulating the rotational speed of the engine in accordance with a sensed rotational engine speed and a manifold pressure.

42. (Previously presented) The method of claim 41 wherein said regulating is further performed in accordance with intake manifold temperature and manifold pressure and includes estimating the air mass flow based on an emptying/filling model of the manifold.

43. (Previously presented) The method of claim 38 which includes pressurizing the mixture provided to the manifold with a compressor driven by a turbine turned by exhaust from the engine.

44. (Previously presented) A method, comprising:

operating an internal combustion engine including a manifold coupled to a number of combustion chambers;

providing a mixture of fuel and air to the combustion chambers through the manifold;

pressurizing the mixture provided to the manifold with a compressor driven by a turbine turned by exhaust from the engine;

detecting a change in rotational speed of the engine;

adjusting the mixture from a first fuel-to-air ratio to a second fuel-to-air ratio in response to said detecting to regulate the rotational speed of the engine; and
driving an electric power generator with the engine during said adjusting.

45. (Previously presented) The method of claim 44 which includes:

adjusting activation timing of a number of ignition devices each associated with a corresponding one of the combustion chambers; and

retarding timing of the ignition devices in response to an engine load loss of 30% or more.

46. (Previously presented) The method of claim 44 wherein said adjusting includes changing a flow of fuel to a mixer with a controllable valve, and the fuel is of a gaseous type including at least one of natural gas, propane, and petroleum gas.

47. (Previously presented) The method of claim 44 which includes regulating the rotational speed of the engine in accordance with a sensed rotational engine speed and a manifold pressure.

48. (Previously presented) The method of claim 47 wherein said regulating is further performed in accordance with intake manifold temperature and manifold pressure and includes estimating the air mass flow based on an emptying/filling model of the manifold.

Response to Office Action
Inventor(s): Thomas, Robert J. et al.
Application No.: 10/081,851
Filed: February 22, 2002
Page 11 of 13